Sections 9.1 and 9.2

Chester Ismay, Tom Linton

Ripon College, Central College

"In learning you will teach, and in teaching you will learn."

- Phil Collins

Conserving Hotel Towels

A recent study (Goldstein et al., 2008) conducted a randomized experiment to investigate how different phrasings on signs placed on bathroom towel racks impacted guests towel reuse behavior. In particular, the researchers were interested in evaluating how messages that communicated different types of social norms impacted towel reuse. One week prior to a guest staying in the room, rooms at a particular hotel were randomly assigned to receive one of the following five messages on a sign hung on the towel bar in the room:

Conserving Hotel Towels

1: "HELP SAVE THE ENVIRONMENT. You can show your respect for nature and help save the environment by reusing your towels during your stay." (No social norm)
2: "JOIN YOUR FELLOW GUESTS IN HELPING TO SAVE THE ENVIRONMENT. 75% of the guests participated in our new resource savings program by using their towels more than once. You can join your fellow guests in this program to help save the environment by reusing your towels during your stay." (Guest identity norm)
3: "JOIN YOUR FELLOW GUESTS IN HELPING TO SAVE THE ENVIRONMENT. 75% of the guests who stayed in this room (#xxx) participated in our new resource savings program by using their towels more than once. You can join your fellow guests in this program to help save the environment by reusing your towels during your stay." (Same room norm)

4: "JOIN YOUR FELLOW CITIZENS IN HELPING TO SAVE THE ENVIRONMENT. 75% of the guests participated in our new resource savings program by using their towels more than once. You can join your fellow citizens in this program to help save the environment by reusing your towels during your stay." (Citizens norm)
5: "JOIN THE MEN AND WOMEN WHO ARE HELPING TO SAVE THE ENVIRONMENT. 76% of the women and 74% of the men participated in our new resource savings program by using their towels more than once. You can join the other men and women in this program to help save the environment by reusing your towels during your stay." (Gender identity norm)

Data were collected on 1595 instances of potential towel reuse. For each of the 1595 instances, room attendants recorded whether or not the hotel guest reused their towels.

Observational Units

(1) What are the observational units?

A Hotel attendants

B Signs

C Towels

D Hotel guests

E None of the above

(2) How many levels (different groups) do the explanatory and response variables have (Explanatory, Response)?

A 2, 2

B 5, 2

C 2, 5

D 5, 5

E Unknown since the response is quantitative

Explanatory Variable

(3) Identify the explanatory variable.

A Whether or not guests reused their towels

B Gender

C Message type on signs

D Whether or not resource savings program was implemented

E None of the above

(4) State the alternative hypothesis to be investigated with this study.

A $H_a : \pi_1 \neq \pi_2 \neq \pi_3 \neq \pi_4 \neq \pi_5$

B $H_a : \pi_1 \neq \pi_2 = \pi_3 = \pi_4 = \pi_5$

C H_a : At least one conditional population proportion is different

D Two of the above are true

E None of the above

	None (1)	Same Room (2)	Citizen (3)	Gender (4)	Guest (5)	*Total*
Reuse Towel	113	151	145	127	150	686
No reuse	192	155	189	183	190	909
Total	305	306	334	310	340	1595

(5) Which message produced the largest proportion of towel reuse? Which produced the smallest?

A Largest = Same Room, Smallest = Citizen

B Largest = Guest, Smallest = Gender

C Largest = Same Room, Smallest = None

D Largest = Guest, Smallest = None

E None of the above

(6) Given the data for this problem, which applet do we use to construct a simulated null distribution using the MAD statistic based on the conditional proportions on the last slide?

A Two Proportions

B Multiple Means

C Theory-Based Inference

D Multiple Proportions

E None of the above

(7) After selecting **reuse** as a Success and selecting **MAD** from the **Statistic** dropdown, we obtain an Observed MAD of 0.055. Use this information and the 1000 simulations below to estimate the p-value.

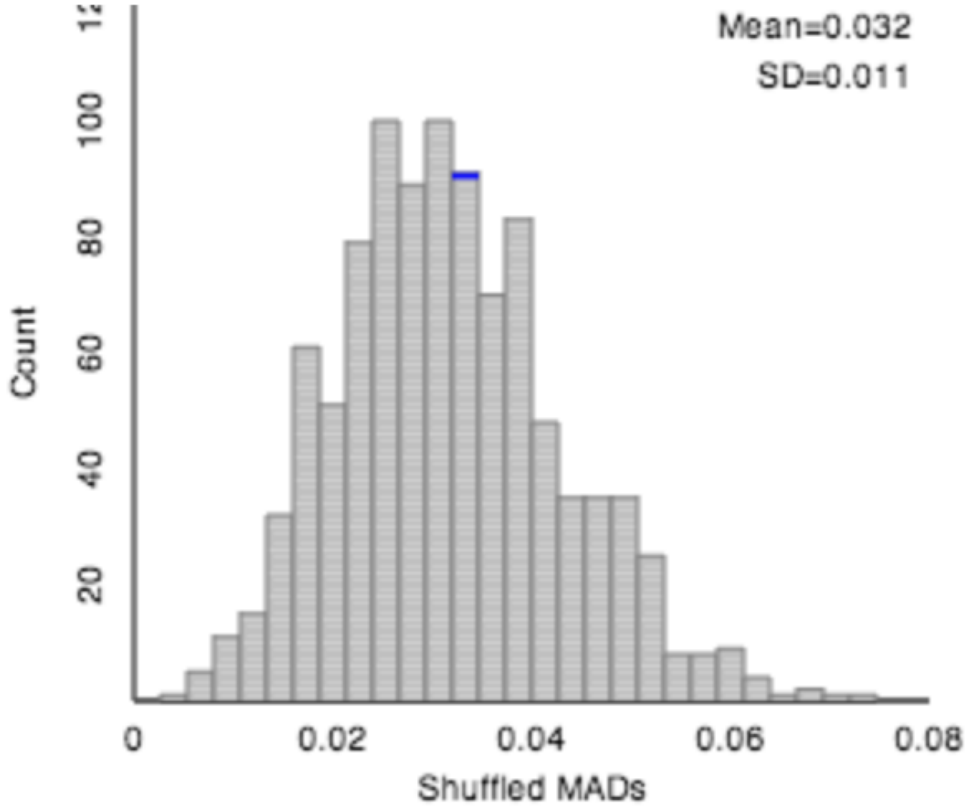
A 0.900

B 0.421

C 0.205

D 0.055

E 0.031



Which diet is best?

An article in the *Journal of the American Medical Association* reported on a randomized, comparative experiment in which 160 American adults were randomly assigned to one of four popular diet plans: Atkins, Ornish, Weight Watchers, and Zone (40 subjects per diet). These subjects were recruited through newspaper and television advertisements in the greater Boston area; all were overweight or obese with body mass index values between 27 and 42. Data for the 93 subjects who completed the 12-month study contains which diet the subject was on and the weight loss in kilograms (positive values indicate weight loss and negative values indicate weight gain).

(8) Identity the correct pair of explanatory and response variables with their type, respectively.

A Quantitative, Quantitative

B Quantitative, Categorical

C Categorical, Quantitative

D Categorical, Categorical

E None of the above

(9) State the null hypothesis for this study.

A The four mean weight losses are not all equal.

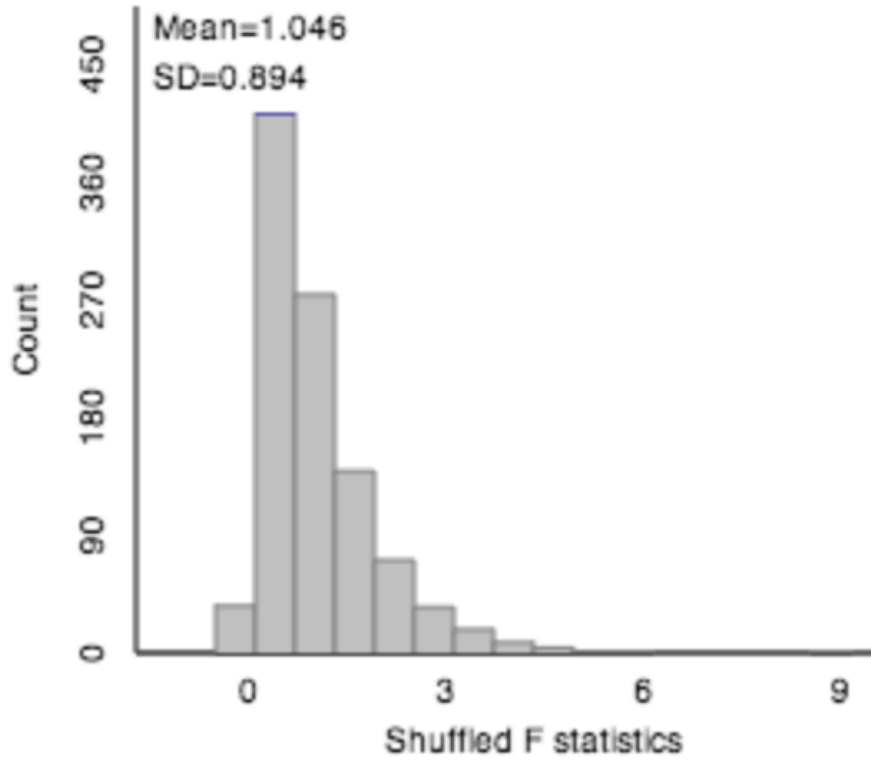
B $\mu_{Atkins} - \mu_{Ornish} - \mu_{WW} - \mu_{Zone} = 0$

C The choice of diet makes a difference on mean weight loss.

D $\mu_i \neq \mu_j$ for at least one pair (i, j)

E None of the above

(10) For this problem, we have an observed F statistic of 0.54. Based on the picture, is there evidence that diet plan affects weight loss?



A Yes, the p-value is very large.

B No, the p-value is very small.

C No, the p-value is very large.

D Yes, the p-value is very small.

(11) Suppose that we actually did find significance. To what population could we infer our results?

A All American adults, since there was random assignment.

B All adults in Boston, since there was random assignment.

C All overweight or obese adults in Boston, since there was random assignment.

D All overweight or obese adults that read the newspaper or watch TV, since there was random assignment.

E None of the above.

Key Terms and Ideas to Understand in Chapter 9

- ANOVA test
- F-distribution / F-statistic
- Follow-up analysis
- Tactile simulation steps (cards/dice/etc.)
- p-value!!!!